

In the Claims

Please substitute the following for the pending claims with the same number:

Please delete Claim 21 without prejudice.

1. (Currently Amended) An integrated circuit package comprising:
an integrated circuit die having an active surface; and
a cooling fluid to be in contact and move laterally across with the active surface.
2. (Original) The integrated circuit package of claim 1 further comprising:
an interposer coupled to the integrated circuit die.
3. (Original) The integrated circuit package of claim 2, wherein the interposer has a microchannel surface that allows the cooling fluid to flow between the interposer and the active surface of the integrated circuit die.
4. (Original) The integrated circuit package of claim 2 further comprising:
a package substrate, wherein a first side of the interposer is coupled to the package substrate via solder bumps, and a second side of the interposer is coupled to the integrated circuit die via solder bumps.
5. (Original) The integrated circuit package of claim 4 further comprising:
an underfill material disposed substantially between the interposer and the package substrate.

6. (Original) The integrated circuit package of claim 1, wherein the integrated circuit die has a microchannel surface.

7. (Original) The integrated circuit package of claim 1 further comprising:
a pump to circulate the cooling fluid.

8. (Currently Amended) A method of forming an integrated circuit package comprising:

attaching an interposer to a package substrate;

attaching an integrated circuit die to the interposer, wherein the integrated circuit die includes an active region;

covering the package substrate, the integrated circuit die, and the interposer with a heat spreader to form an internal chamber;

filling the internal chamber with a cooling fluid, wherein the cooling fluid contacts a region between the interposer and the integrated circuit die and wherein the cooling fluid is to contact contacts and move laterally across the active region.

9. (Original) The method of claim 8, wherein the filling of the internal chamber is done by pumping cooling fluid through a via in the package substrate.

10. (Previously Amended) A method of forming an integrated circuit package comprising:

attaching an interposer to a package substrate;

attaching an integrated circuit die to the interposer;

covering the package substrate, the integrated circuit die, and the interposer with a heat spreader to form an internal chamber;
filling the internal chamber with a cooling fluid by pumping cooling fluid through a via in the package substrate and sealing the via after the internal chamber is filled.

11. (Previously Amended) A method of forming an integrated circuit package comprising:

attaching an interposer to a package substrate;
attaching an integrated circuit die to the interposer;
covering the package substrate, the integrated circuit die, and the interposer with a heat spreader to form an internal chamber;
filling the internal chamber with a cooling fluid by pumping cooling fluid through an inlet and sealing closed the inlet when the filling is complete.

12. (Currently Amended) A method of cooling an integrated circuit die within an integrated circuit package comprising:

providing power to the integrated circuit die; and
moving a cooling fluid laterally across an active surface of the integrated circuit die.

13. (Original) The method of claim 12, wherein the moving of the cooling fluid is performed by thermal convection.

14. (Original) The method of claim 12, wherein the moving of the cooling fluid is performed by a pump located inside of the integrated circuit package.

15. (Original) The method of claim 12, wherein the moving of the cooling fluid is performed by a pump located outside of the integrated circuit package.

16. (Original) The method of claim 12, wherein the cooling fluid changes phase by evaporating at a first location of the integrated circuit package and condensing at a second location of the integrated circuit package.

17. (Currently Amended) An integrated circuit package comprising:

- a package substrate;
- a first integrated circuit die having an active surface;
- an interposer disposed between the package substrate and the first integrated circuit die, the interposer establishing electrical connectivity between the first integrated circuit die and the package substrate; and
- a cooling fluid disposed between the first integrated circuit die and the interposer, wherein the cooling fluid is to contact and move laterally across contacts the active surface.

18. (Original) The integrated circuit package of claim 17 further comprising:

- a heat spreader covering the package substrate, the first integrated circuit die, the cooling fluid, and the interposer.

19. (Original) The integrated circuit package of claim 18 further comprising:
 - a heat sink coupled to the heat spreader.
20. (Original) The integrated circuit package of claim 18, wherein the first integrated circuit die has a microchannel surface in contact with the heat spreader, the microchannel surface allowing cooling fluid to flow across the microchannel surface.
21. Please delete Claim 21 without prejudice.
22. (Original) The integrated circuit package of claim 17, wherein the interposer provides electrical functionality in addition to electrical connectivity.
23. (Original) The integrated circuit package of claim 22, wherein the interposer provides capacitance.
24. (Original) The integrated circuit package of claim 22, wherein the interposer comprises a second integrated circuit die.
25. (Original) The integrated circuit package of claim 24, wherein the second integrated circuit provides an optical to electrical interface for the first integrated circuit die.
26. (Original) The integrated circuit package of claim 17, wherein the interposer has a microchannel surface in contact with the active surface of the first integrated circuit die.
27. (Currently Amended) An integrated circuit package comprising:

a integrated circuit die housed within a chamber, wherein the integrated circuit die includes an active region; and
a cooling fluid filling the chamber and ~~is to~~ contact with and move
laterally across the active region of the integrated circuit die.

- (C) 28. (Original) The integrated circuit package of claim 27 further comprising:
a plurality of microchannels in a surface of the integrated circuit die.
29. (Original) The integrated circuit package of claim 28 further comprising:
a pump located within the integrated circuit package to pump the cooling fluid
through at least a portion of the plurality of microchannels.